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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 15

Application Number: 09/558,532
Filing Date: April 26, 2000
Appellant(s): SCHANTZ ET AL.

Benjamin Aaron Adler, Ph.D., J.D.
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 30 December 2002.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 4-7, 9-11, 13-17, 21, 28-32, 38,43-44 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

A substantially correct copy of appealed claim 4 appears on page 21 of the Appendix to the appellant's brief. The minor errors are as follows: The claim repeats "A method" at the beginning of the claim.

(9) Prior Art of Record

6,086,190	Schantz et al	7-2000
5,474,796	Brennan	12-1995
5,807,522	Brown et al	9-1998

4,067,019 Fleischer et al 1-1978

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 4-7, 9-11, 13-17, 21, 28-32, 38,43-44 are rejected under 35 U.S.C. 103. This rejection is set forth in prior Office Action, Paper No. 9.

(11) Response to Argument

In order to understand the issued in this application, the underlying technology will be briefly discussed. The claimed invention is drawn to an apparatus, method and computer program product for making arrays of biopolymers. The invention is based on an apparatus comprising a droplet dispensing unit, a sensing element and amplifier and a processor for controlling apparatus functions. It is unquestioned that the prior art teaches an apparatus comprising a droplet dispensing unit, a sensing element and amplifier and a processor for controlling the apparatus functions (e.g. Schantz et al). And it is unquestioned that the prior art (e.g. Brennan) teaches droplet dispensing devices for making arrays of biopolymers.

The instantly claimed apparatus is identical to that of Schantz et al except for one element and that single element is that Schantz et al do not teach that their dispensing device deposits biopolymers.

Schantz et al teach an apparatus comprising a drop dispensing unit, a sensing element and amplifier and a processor wherein the processor causes the drop dispensing unit to dispense droplets, evaluates the dispensing and if an error is detected, activates an operator alert and/or compensates for the error during dispensing (Column 6, lines 38-49). The invention of Schantz et al is designed to sense and analyze dispensed droplets to determine if the dispensing unit is functioning accurately (Column 1, lines 25-49). The invention of Schantz et al provides for detection and correction of dispensing error to thereby minimize the

cost of printing (Column 2, lines 21-23). As noted above, Schantz et al teach every element of the instantly claimed invention except one i.e. biopolymer deposit. However, biopolymer droplet dispensing units and their use for array production was well known in the art at the time the instant invention was made. Specifically, Brennan teaches that dispensing units (piezoelectric pumps) dispense droplets of very small volume to produce a high density biopolymer array (Column 2, lines 15-22 and Column 6, lines 18-26). Brennan is obviously concerned with precisely controlling the droplet volume and accuracy dispensing the biopolymers (Column 2, lines 1-7). The invention of Schantz et al precisely controls the volume and accuracy of dispensed droplets while at the same time minimizing costs (Column 2, lines 21-23 and Column 3, line 65-Column 4, line 12). As such, one of ordinary skill in the art would have been motivated to combine the teaching of Schantz et al and Brennan to dispense biopolymers using the apparatus of Schantz et al based on the need for accurate control of biopolymer dispensing taught by Brennan and for the additional benefit of minimizing costs as taught by Schantz et al (Column 2, lines 21-23).

Now Appellant's arguments for each grouping of claims will be addressed.

Group I-Claims 4, 5, 9, 28, **29** and 43

Appellant traverses the rejection of Claims 4, 5, 9, 28, 29 and 43 and states that the claims stand or fall together.

Claim 29 is drawn to an apparatus comprising a drop dispensing unit, a sensing element and a processor wherein the processor causes the drop dispensing unit to dispense droplets and evaluates a performance of the dispensing unit and when an error is detected, prior to causing the drop dispenser to dispense droplets onto that same substrate, activates an operator alert.

Appellant argues that the Examiner has not pointed to anything in the references which discloses or suggests that during biopolymer array fabrication, detecting an error after

dispensing some droplets onto the array and then dispensing further droplets onto the same array with the error being corrected or compensated for.

Schantz et al clearly teach an apparatus similar to that instantly claimed comprising a processor which, when an error is detected activates an operator alert and/or when an error is detected compensates for the error (Column 6, lines 23-49). For example, following evaluation, the processor of Schantz et al signals a go/no-go response to the operator. This meets the limitations of Claim 29 because the go/no-go signal is an error detection event which sends the operator an alert (e.g. no-go). The apparatus of Schantz et al differs from the instantly claimed apparatus only in that they do not teach their dispensing unit can carry biopolymers. However, the office relied on the teaching of Brennan et al for this element of the claimed invention who teach a motivation for utilizing the instantly claimed apparatus to dispense biopolymers i.e. to dispense droplets of very small volume precisely to provide a high density biopolymer array (Column 2, lines 15-22 and Column 6, lines 18-26). It would have been obvious to one of ordinary skill in the art to modify the droplets dispensed in by the apparatus of Schantz et al. (a) with the biopolymers of Brennan to thereby dispense biopolymer droplets onto a substrate. The ordinary practitioner would have been motivated to utilize the Schantz et al apparatus to dispense biopolymer droplets based on the need for accurate control of biopolymer dispensing taught by Brennan and for the additional benefit of minimizing costs as taught by Schantz et al (Column 2, lines 21-23).

Group IA-Claims 5, **29**

Appellant traverses the rejection of Claims 5 and 29 and states that the claims stand or fall together. The arguments regarding Claim 29 are addressed immediately above.

Group IB-Claim **9**

Appellant traverses the rejection of Claim 9.

The claim is drawn to the method of Claim 4 further comprising a pulse jet which can de-primed and which is re-primed.

Appellant argues that Schantz et al makes no reference to priming and argues that there is no suggestion for re-priming the pulse jet. Appellant further argues that the Examiner's statement that the instantly claimed priming and re-priming being encompassed by the voltage application and adjustment in preparation for printing of Schantz is not within the meaning of the claim. To support this argument, Appellant, on page 11, cites the Merriam-Webster on-line dictionary for a definition of priming.

The definition provided on page 11 of Appellant's brief defines priming as "stimulate". Clearly, the voltage application of Schantz primes and re-primes the dispenser as defined by Merriam-Webster because voltage application stimulates the dispenser to dispense (Column 6, line 65-Column 7, line 17). Therefore, given the definition provided by Appellant, the voltage application of Schantz meets the limitations of Claim 9.

Group II-Claim **7**

Appellant traverses the rejection of Claim 7.

Claim 7 is drawn to the method of fabricating an array comprising changing the biopolymers or biopolymer precursors in the dispenser unit to different biopolymers or biopolymer precursors wherein evaluation and is preformed after the change and before the dispensing.

Appellant argues that the Examiner has not pointed to anything in the cited references which motivates one to perform the evaluation after the change and before the dispensing. Schantz et al teach the method wherein dispensed droplets are detected and evaluated (Column 6, line 38-Column 7, line 17) to thereby determine if the dispensing unit is functioning accurately (Column 1, lines 25-49). They further teach that the detection and

evaluation followed by any error detected minimizes the cost of printing (Column 2, lines 21-23).

The method of Schantz et al evaluates dispensing to thereby adjust subsequent dispensing by sending a go/no-go signal, compensating for an error and/or adjusting the number of drops dispensed (Column 6, lines 38-39, 44-49 and 60-64). This express teaching of Schantz et al directly suggest that the print head is consistently evaluating the effectiveness of the dispensation including between the dispensing steps and therefore, before subsequent dispensing steps. As such, the method of Schantz et al merely differs from that instantly claimed in that Schantz et al do not deposit biopolymers and hence do not change biopolymers in the dispensing unit. However, Brennan teaches the similar method wherein different reagents are deposited to produce an array of biopolymers (Fig. 6). Given the fact that Brennan deposits different biopolymer droplets to produce a high-density array of 10^6 different biopolymers (Column 9, lines 10-12 and 48-55) and given the fact that Schantz et al is especially concerned with detection and evaluation of dispensed droplets to optimize accuracy while minimizing the cost of dispensing (Column 1, lines 25-49 and Column 2, lines 21-23), it would have been obvious to one of ordinary skill in the art to combine their teachings and to detect and evaluate dispensed biopolymer droplets before dispensing onto the array because the ordinary practitioner would have desired the most economical and accurate means of high-density array production.

Group III Claims 10, 11, 31, **32**, 44

Appellant traverses the rejection of Claims 10, 11, 31, 32 and 4 and states that the claims stand or fall together.

Claim 32 is drawn to an apparatus comprising a drop dispensing unit, a sensing element and a processor wherein the processor causes the drop dispensing unit to dispense droplets and evaluates a performance of the dispensing unit and when an error is detected

identifies one or more features on the array which are defective as a result of the error and further communicates the identify of the feature to a remote location.

Appellant argues that while Schantz et al teach correlating droplet detection values with faulty nozzles, this is not the same as identifying one or more features on a biopolymer array which are defective as a result of the error. Appellant further argues that Schantz et al do not teach or suggest communicating an identity of the defective feature as instantly claimed.

The apparatus of Schantz et al comprises a processor that is programmed to perform the function of dispensing droplets, evaluating a performance characteristic and determine droplet error (Column 3, line 65-Column 4, line 12 and Column 4, line 60-Column 5, line 6) and communicates the detection to a remote location (i.e. printer processor, Column 5, lines 5-10, 45-51). The functionality of Schantz's processor is very similar to that instantly claimed and differs only in that Schantz's processor is not programmed to identify features on a biopolymer array which are defective as a result of the error. Brennan teaches the similar apparatus which deposits biopolymers onto an array to high-density array and wherein the apparatus reproducibly deposits biopolymers closely and accurately (Column 2, lines 5-7, 18-22 and Column 9, lines 55-57). While Brennan is silent regarding processor-controlled deposit, they clearly suggested rigorous control of the depositing is desirable.

The functionality of processors is merely computer algorithms. Computer algorithms are well known in the art and are routinely practiced and designed to perform desired functions. Schantz et al teach processor controlled deposit and error detection. Brennan suggests controlled deposit and accurate deposit of biopolymers is desired. It would have been obvious to one of ordinary skill to combine the teachings of Schantz et al and Brennan and to modify the algorithm of Schantz to identify feature errors on the biopolymer array of Brennan for the obvious benefits of accurate and precise deposit of Brennan's biopolymer onto their array.

Group IIIA Claim 11, **32**

Appellant traverses the rejection of Claims 11 and 32 and states that the claims stand or fall together. The arguments regarding Claim 32 are addressed immediately above.

Group IV- Claims **13**, 14

Appellant traverses the rejection of Claims 13 and 14 and states that the claims stand or fall together.

Claim 13 is drawn to a method of fabricating an array of biopolymers comprising dispensing droplets, detecting electrical signals from the droplets, evaluating a performance characteristic based on the detection wherein the dispenser comprises one or more jest which eject a droplet in response to a signal which requires priming and the evaluated characteristic is whether the one or more jets are primed prior to dispensing.

Appellant argues that the Schantz et al passage cited by the Examiner does not disclose that the jets require priming. Appellant further argues that Schantz et al do not teach or suggest an evaluated characteristic being whether the jets are primed prior to dispensing.

The method of Schantz et al evaluates performance characteristics of the deposition apparatus to by detecting electrical signals from the droplets deposited wherein the performance characteristic is whether one or more of the jets were primed before deposit. Specifically, Schantz et al detects the number of drops deposited and determines whether the jets were primed (fired/stimulated) prior to deposit to thereby determine performance characteristic of the apparatus (Column 6, lines 23-37). The method of Schantz et al differs from the instantly claimed method only in that Schantz et al do not deposit biopolymers. However, the office relied on the teaching of Brennan et al for this element of the claimed invention as discussed above.

Appellant also repeats the previous arguments of Claim 9 stating that the voltage application of Schantz et al is not regarded as priming. The arguments regarding Claim 9 and priming are addressed above.

Group V-Claim **17**

Appellant traverses the rejection of Claim 17.

Claim 17 is drawn to a method of fabricating an array of biopolymers comprising dispensing droplets onto a sensing element, detecting electrical signals resulting from the dispensed droplets, evaluating a performance characteristic of the deposition apparatus wherein the sensing element **optionally** comprises the substrate.

Appellant argues that Schantz et al do not teach or suggest using a substrate on which an array is formed as a sensor. Appellant further argues that even if combined with the teaching of Brennan, the resulting apparatus is not the substrate on which an array is formed.

Appellant's arguments regarding the substrate of Claim 17 are not relevant to the claim because the sensing element comprising a substrate is "optionally" claimed and therefore is not a required limitation of the claim. Therefore, it not a requirement that the prior art discloses a sensing element comprising a substrate.

Group VI-Claims 6, **30**

Appellant traverses the rejection of Claims 6 and 30 and states that the claims stand or fall together.

Claim 30 is drawn to an apparatus for fabricating an array of biopolymers comprising a drop dispensing unit, a sensing element and amplifier and a processor wherein the processor causes the dispensing unit to dispense droplets and evaluates a performance characteristic of the dispensing element and if an error is detected, activates an operator alert, and further to

dispense droplet toward the sensing element on the same substrate and when an error is detecting operates the apparatus to correct or compensate for the error.

Appellant argues that the Examiner does not even allege that the cited references disclose or suggest that the deposition apparatus is operated so as to compensate for the error during dispensing of droplets on the same substrate.

The apparatus of Schantz et al comprises a processor which operates the apparatus to compensate for errors during dispensing (Column 6, lines 38-49). The apparatus of Schantz et al differs from that instantly claimed only in that Schantz do not teach the errors are compensated for during dispensing of other arrays on the same substrate. However, the office relied on the teaching of Brown et al for a motivation to apply the error compensation of Schantz et al to the dispensing on the same substrate. Brown et al. teach a similar method comprising dispensing biopolymer droplets onto a substrate for each of the multiple addresses, wherein multiple arrays are fabricated on the same substrate (Column 11, lines 43-61). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the array of Schantz et al. and Brennan with the multiple array fabrication of Brown et al. to thereby fabricate identical substrates for performing mass screenings with minimal handling for the expected benefit of rapid and convenient screening as taught by Brown et al. (Column 15, lines 59-67).

Group VII-Claim 15, **16**

Appellant traverses the rejection of Claims 15 and 16 and states that the claims stand or fall together.

Claim 16 is drawn to a method of fabricating an array of biopolymers comprising dispensing droplets onto a sensing element, detecting electrical signals form the dispensed droplets, evaluating a performance characteristic of the deposition apparatus wherein the

dispenser unit is repeated scanned across the substrate while dispensing and the sensing element is struck by droplets when the dispenser unit passes beyond the array being fabricated.

Schantz et al. teach a method similar to that claimed (Column 3, lines 23-30) and differs only in that they do not teach the dispenser unit is repeatedly scanned across the substrate while dispensing droplets. However, Brown et al. teach the similar method wherein the dispenser unit is repeatedly scanned across the substrate (Column 7, lines 17-34). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the dispenser of Schantz et al. and Brennan with the dispenser which scans across the substrate as taught by Brown et al. to thereby dispense repeatedly and accurately the biopolymer droplets for the expected benefit of providing a substrate capable of rapid and convenient screening as taught by Brown et al. (Column 15, lines 59-67).

Group VIII-Claim **16**

Appellant traverses the rejection of Claim 16. Claim 16 is addressed directly above.

Group IX-Claim **21**

Appellant traverses the rejection of Claim 21.

Claim 21 is drawn to a method of fabricating an array of biopolymers comprising dispensing droplets onto the sensing element, detecting electrical signals from the dispensed droplets, evaluating a performance characteristic of the deposition apparatus wherein the characteristic is the velocity of droplets dispensed and further comprising dispensing multiple droplets form at least two different distances wherein the velocity is evaluated based on the difference between the detected signal.

Appellant argues that the Examiner has not pointed to a teaching or suggestion in the references wherein droplet velocity is evaluated based on the phase difference between the detected signals from multiple droplets at each distance.

Schantz et al. teach a method similar to that instantly claimed wherein performance characteristic is evaluated to detect any error to thereby minimize the cost and increase the accuracy of dispensing (Column 2, lines 21-35) and they teach a performance characteristic which is an evaluated is the velocity of dispensing (Column 4, lines 9-12). Schantz et al differ from the instantly claimed apparatus in that they do not teach evaluating velocity from at least two different distances. However, Fleischer et al. teach the motivation for evaluating performance characteristics (e.g. positioning and relative positioning) of droplet dispensing i.e. proper dispensing alignment is critical for quality substrate fabrication. Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to further analyze the performance of the dispenser by dispensing droplets at two or more distances from the sensor to thereby analyze numerous performance characteristics for the obvious benefits of fabricating a substrate of the highest quality.

Group X-Claim **38**

Appellant traverses the rejection of Claim 38.

Claim 38 is drawn to an apparatus for fabricating an array of biopolymers comprising a drop dispensing unit, a sensing element and amplifier and a processor wherein the processor causes the dispensing unit to dispense droplets toward the sensing element and evaluates a performance characteristic of the velocity or placement of the droplets and wherein the processor causes the dispenser to dispense multiple droplets at each of at least two different distances from the sensor and velocity is evaluated based on the phase difference between detected signals.

Appellant argues that the Examiner has not pointed to a teaching or suggestion in the references wherein droplet velocity is evaluated based on the phase difference between the detected signals from multiple droplets at each distance.

Schantz et al. teach an apparatus similar to that instantly claimed comprising a processor wherein a performance characteristic is evaluated to detect any error to thereby minimize the cost and increase the accuracy of dispensing (Column 2, lines 21-35) and they teach a performance characteristic which is an evaluated is the velocity of droplet dispensing (Column 4, lines 9-12). Schantz et al differ only from the instantly claimed apparatus in that they do not teach evaluating velocity from at least two different distances. However, Fleischer et al. teach the motivation for evaluating performance characteristics (e.g. positioning and relative positioning) of droplet dispensing i.e. proper dispensing alignment is critical for quality substrate fabrication. Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to further analyze the performance of the dispenser by dispensing droplets at two or more distances from the sensor to thereby analyze numerous performance characteristics for the obvious benefits of fabricating a substrate of the highest quality.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

BJF
March 6, 2003

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